U. S. DEPARTMENT OF AGRICULTURE

FARMERS' BULLETIN No. 1315

CLEANING MILKING MACHINES

MILKING MACHINES are playing a larger and larger part in the economics of dairying. For this reason care must be taken in sanitation so that nothing will impede their continued and increasing use.

Milking machines must be thoroughly washed and treated with heat or a chlorine solution, if clean milk of a low bacterial content is to be produced.

The Bureau of Dairy Industry of the United States Department of Agriculture has found that the methods outlined in this bulletin are both simple and effective.

The method illustrated by the pictures given here applies to the vacuum-pipe-line type of milker having rubber teat-cup liners. The same principle of cleaning applies to other types, but it may be necessary to vary details.

Washington, D. C.

Issued March 1923
Revised February 1939

CLEANING MILKING MACHINES

By L. H. BURGWALD,[1] *associate market-milk specialist*
Revised by FRED M. GRANT, *assistant market-milk specialist*
Division of Market-Milk Investigations, Bureau of Dairy Industry

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NECESSITY FOR PROPER CLEANING

THE USE OF mechanical milkers is becoming more common in the production of market milk, and the extension of their use brings up the problem of keeping the machines clean. The dairy utensil which has not been subjected to heat or a chlorine solution is one of the chief means by which fresh milk is contaminated by bacteria. For this reason each additional piece of apparatus with which milk comes in contact may be an additional source of contamination. If the milking machine is not washed and properly treated with heat or chlorine it may be the direct cause of large numbers of bacteria in milk.

By careful attention to cleanliness even certified milk is being produced by the use of milking machines, and market milk of good grade is being produced with milking machines operated under ordinary farm conditions. There is no short cut, however, to cleanliness; clean milk cannot be obtained by using neglected machines. To attain this objective machines must be thoroughly and regularly washed and further treated with heat or a chlorine solution.

The United States Department of Agriculture has conducted investigations in the cleaning of milking machines and from the results obtained it advocates methods of cleaning that are simple and effective in producing milk uniformly low in bacteria.

PARTS WHICH REQUIRE CAREFUL ATTENTION

The construction of milking machines makes it necessary that persistent care be exercised in cleaning them. Each of the following parts require careful attention:

- Rubber tubing, including glass unions.
- Teat cups and inflations.
- Claws.
- Pail.
- Head.
- Valves.
- Moisture traps.
- Vacuum lines.

HEAT TREATMENT FOR MILKING MACHINES

The heat method of treating milking machines which is presented in this bulletin was tried on a number of farms and proved successful. Its effectiveness is shown by the following results obtained on samples of machine-drawn milk at farms where this method was used.

[1] Resigned October 1, 1929.

Samples taken at 13 farms using various methods other than that of heat for the subsequent treatment of the machines following washing had an average bacterial count of 257,900 per milliliter for 74 samples.[2] Samples taken at the same farms, when the heat method of treating the machines was used, had an average bacterial count of 19,300 per milliliter for 261 samples.

Samples of machine-drawn milk taken at a total of 20 farms using this method for treating the machines had an average bacterial count of 13,750 per milliliter for 622 samples, and 376 of the samples had a count of 10,000 or less per milliliter.

The effectiveness of heat for treating milking machines on some representative individual farms is shown in table 1.

TABLE 1.—*Effectiveness of heat for treating milking machines*

Farm No.	Number of samples	Period covered	Average bacterial count per milliliter	Farm No.	Number of samples	Period covered	Average bacterial count per milliliter
1	188	2 years	12,700	4	79	4 months	11,500
2	31	2 months	23,100	5	45	2 months	5,100
3	45	3 weeks	17,400	6	74	5 months	5,600

The bacterial count was lower after the heat treatment was used than after either a chlorinated-lime solution or a saturated-brine and chlorinated-lime solution was used, which showed that the heat treatment was the most effective of the three methods.

All bacterial counts are of samples taken under actual farm conditions direct from the machine pail. All machines were handled entirely by the owner or his employees according to a set of directions left with them. The average age of samples when count was made was about 12 hours. Standard methods were used in making the bacteriological analyses.

EFFECT OF HEAT ON THE RUBBER PARTS

Experiments were carried on by the Department on the length of life of the rubber parts when the heat method was used. This consists in placing the unit (teat cups, claw, and tubing) in hot water at a temperature of 160° to 165° F. between milkings, the water cooling gradually. The average length of life of the teat-cup liners was about 13 weeks. The short rubber milk tubes lasted about 24 weeks, and the short air tubes and long milk tube lasted for nearly 31 weeks.

Observations made at different farms have shown that some users have obtained as long as 17 weeks' wear out of the teat-cup liners when this method was employed but others have obtained only 6 weeks' service. This variation can be attributed to four causes: (1) The grade of rubber used in making the liners, (2) the number of cows milked with a set of rubbers, (3) the condition of rubbers when discarded, and (4) care and cleanliness of rubbers.

1. The life of the rubber liners and mouthpieces varies considerably under exactly the same care and use. This is undoubtedly caused by the difference in grade of rubber.

[2] The term "bacterial count" means the number of bacteria found in a specified quantity of milk, usually a milliliter. A milliliter equals about 16 drops.

2. The number of cows milked with the machine and the number of milkings each day also affect the life of the rubber. The oftener the teat-cup rubbers are used the sooner they wear out.

3. There is a great difference in the degree of wear at which the rubbers are discarded by various operators. Some operators replace rubber parts that are still in good enough condition to last several weeks. These operators are usually those who have large numbers of cows to milk. They say that the time saved in milking by replacing rubbers frequently more than pays them for the additional expense of new rubbers. In no case, however, should old, cracked, or split rubbers be used.

4. It is necessary that the rubbers be thoroughly cleaned before heating, as butterfat has a deleterious effect on them at the temperatures used and shortens their life materially.

THE HEAT METHOD FOR TREATING MILKING MACHINES, TOLD IN PICTURES

Steps in the care and use of milking machines are shown in figures 1 to 12 illustrating the heat method of treatment.

TREATMENT WITH CHLORINE

In the chlorine method of treatment the milking machine is handled in the same manner as when the hot-water method is used, except that the parts, instead of being immersed in hot water, are immersed in a chlorine solution containing 200 parts per million of available chlorine. Various commercial preparations may be used for preparing the chlorine solution. A stock solution, however, may be made as follows: Make a smooth, watery paste of 12 ounces of commercial chloride of lime containing 30 percent available chlorine (or 15 ounces of chloride of lime containing 24 percent available chlorine), then add water slowly, and stir thoroughly until the solution amounts to 2 gallons. Allow the solution to settle, and strain into a glass bottle or jar and keep it tightly closed in a cool, dark room. A solution containing 200 parts available chlorine per million can be made by adding 1 pint of this stock solution to each 8 gallons of water. The milking-machine parts may be left in this solution until the next milking, or, after being immersed for not less than 2 minutes, they may be stored where they will be free from contamination. The teat cups and tubes are often hung on special racks (fig. 13) where they are kept full of the chlorine solution.

VARIATIONS OF THE HEAT METHOD

Experiments on some variations of the heat method were conducted by the United States Department of Agriculture. Under these methods the milking machines are handled in the same manner as when the heat method is used, except that the units are removed from the hot water at the end of 20 to 40 minutes. Between milkings the units may then be placed (p. 14) in a refrigerator or cold-storage room, or in a weak chlorine solution made fresh daily by using 3 ounces of the stock solution described under Treatment with Chlorine, to 4 gallons of cold water, or they may be hung in the milk room if they are protected from contamination by flies and dust.

FIGURE 1.—Immediately after milking, the machines are rinsed with cold or lukewarm water drawn through the machines by vacuum. The flow should be broken occasionally by pulling the teat cups out of the water and then immediately immersing them again. This is done 10 or 12 times.

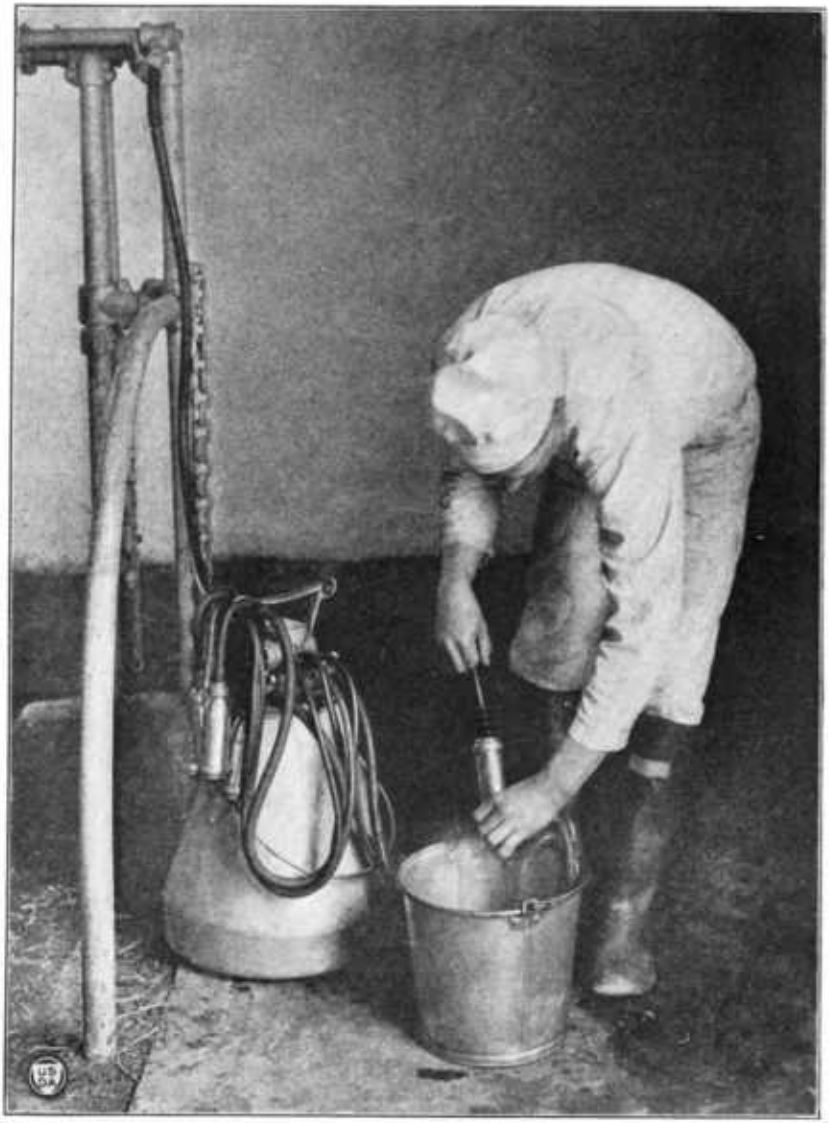

FIGURE 2.—Repeat the rinsing process, using hot water containing washing powder. Teat cups and tubing are washed with a brush at this time. Then rinse the machine with clean water drawn through by vacuum, in the same manner as the operation shown in figure 1.

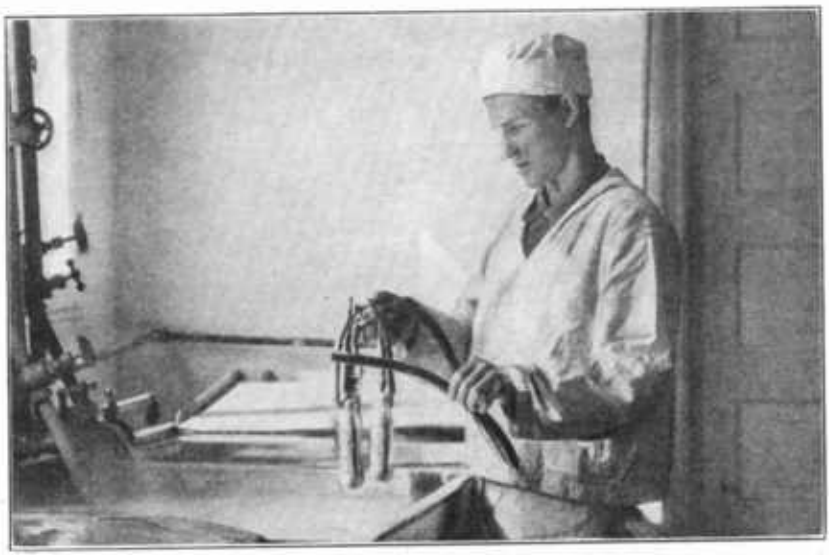

FIGURE 3.—The long milk tube with claw and teat cups is then detached from the head of the pail. Air tubes (on machines of inflation type) are plugged, and the whole is placed in a tank or a can of clean water, care being taken that all parts are entirely submerged.

FIGURE 4.—The water is then heated preferably with steam, to a temperature of from 160° to 165° F. and then allowed to cool. The parts remain there until the next milking. A covered tank is preferable.

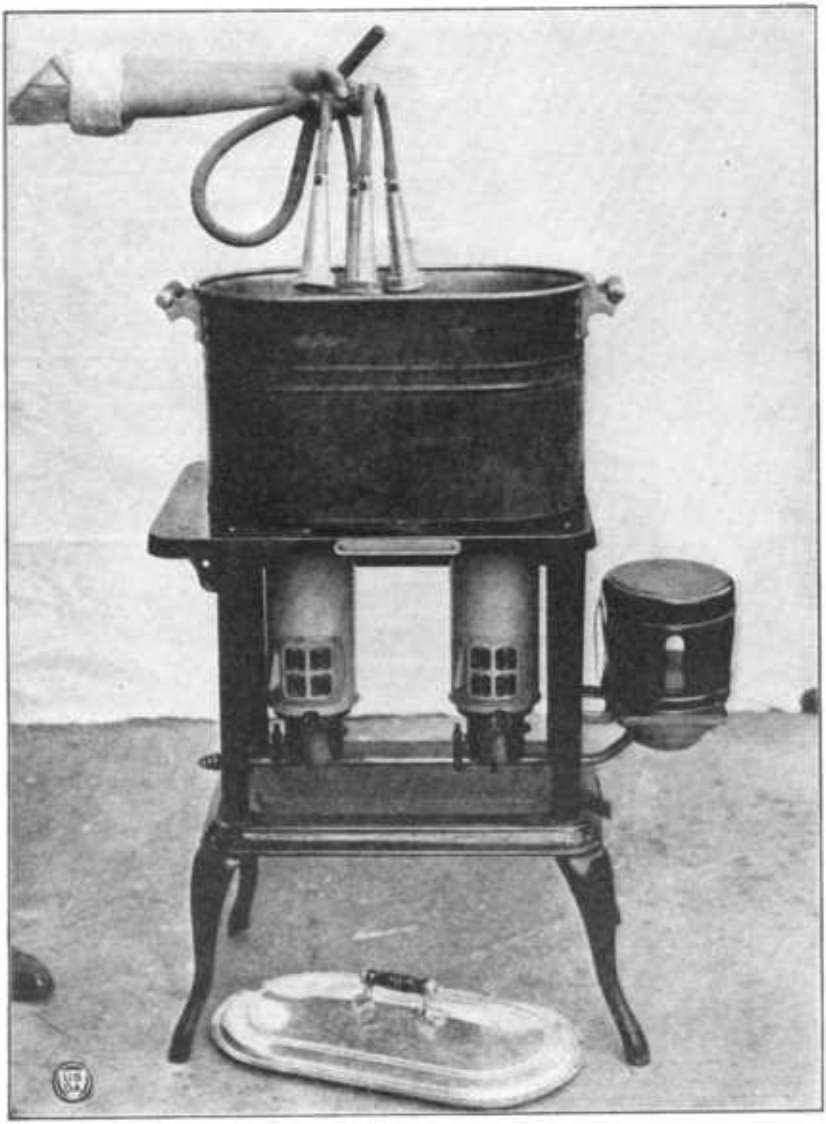

FIGURE 5.—Where steam is not available for heating, the water may be heated in a wash boiler on a stove. If this is done, it is best not to place the rubber parts in the water until the proper temperature has been reached and the boiler removed from the stove; otherwise the rubber parts may be injured by coming into too close contact with the heating medium.

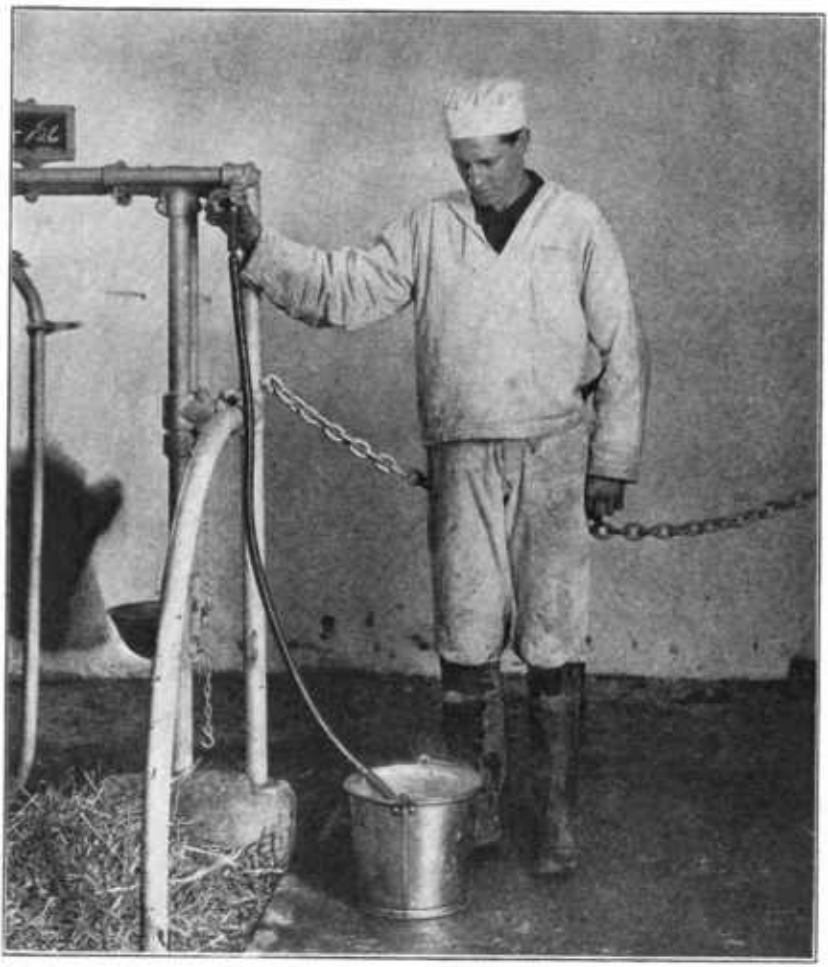

FIGURE 6.—The vacuum line should be cleaned about twice a year by drawing hot water, containing washing powder, through it with vacuum. If milk is drawn into the vacuum line, the pipe should be cleaned immediately after milking.

FIGURE 7.—The machines should be taken entirely apart and washed thoroughly with brushes and hot water containing washing powder.

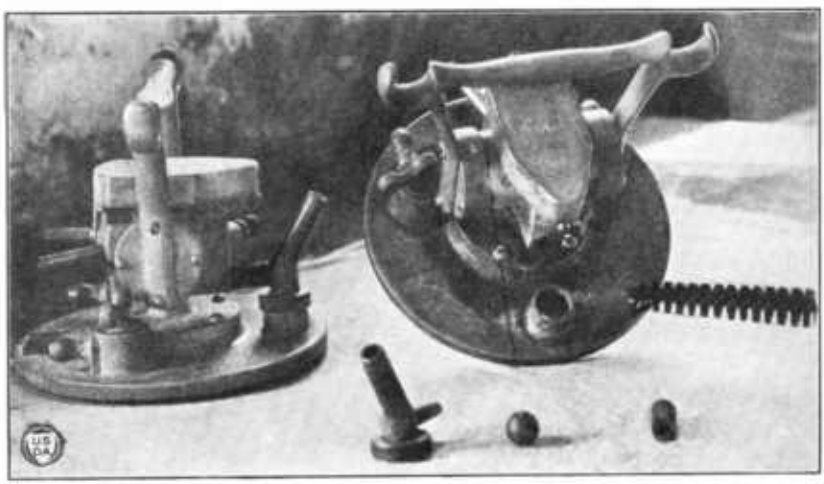

FIGURE 8.—The moisture trap or check valve on the head of the machine (cover of pail) should be cleaned every day.

FIGURE 9.—Milking-machine pails and covers should be thoroughly washed after every milking and then treated to kill bacteria.

FIGURE 10.—Milking-machine pails and covers should be treated with steam or a chlorine solution. Pulsators and electric motor should be removed before such treatment.

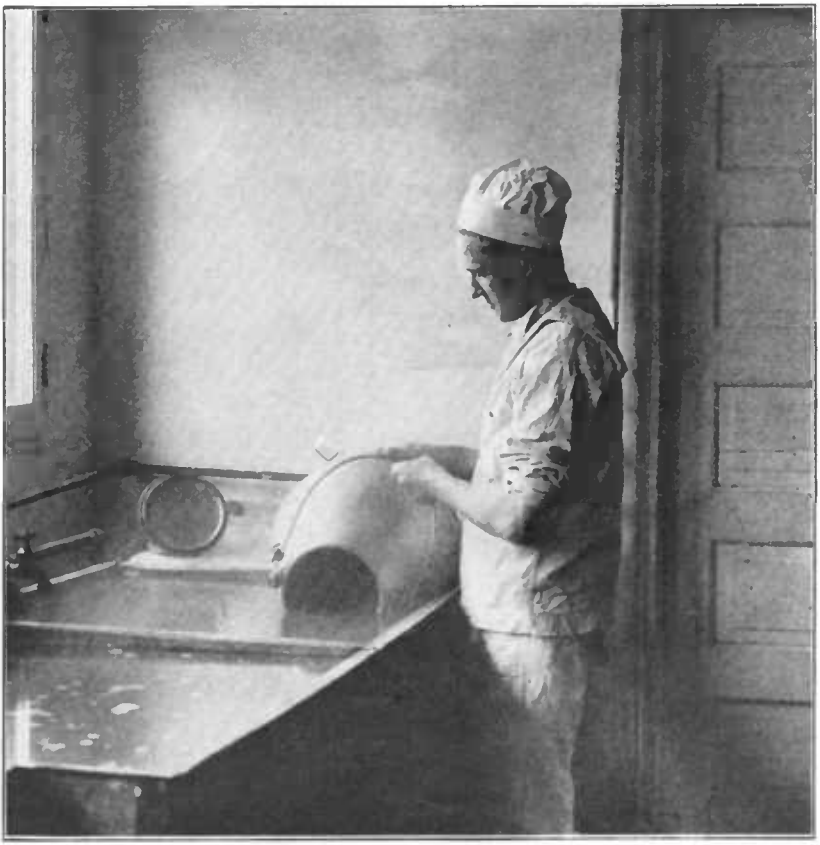

FIGURE 11.—If steam is not available, the covers and pails should be treated by being immersed in boiling water or a chlorine solution.

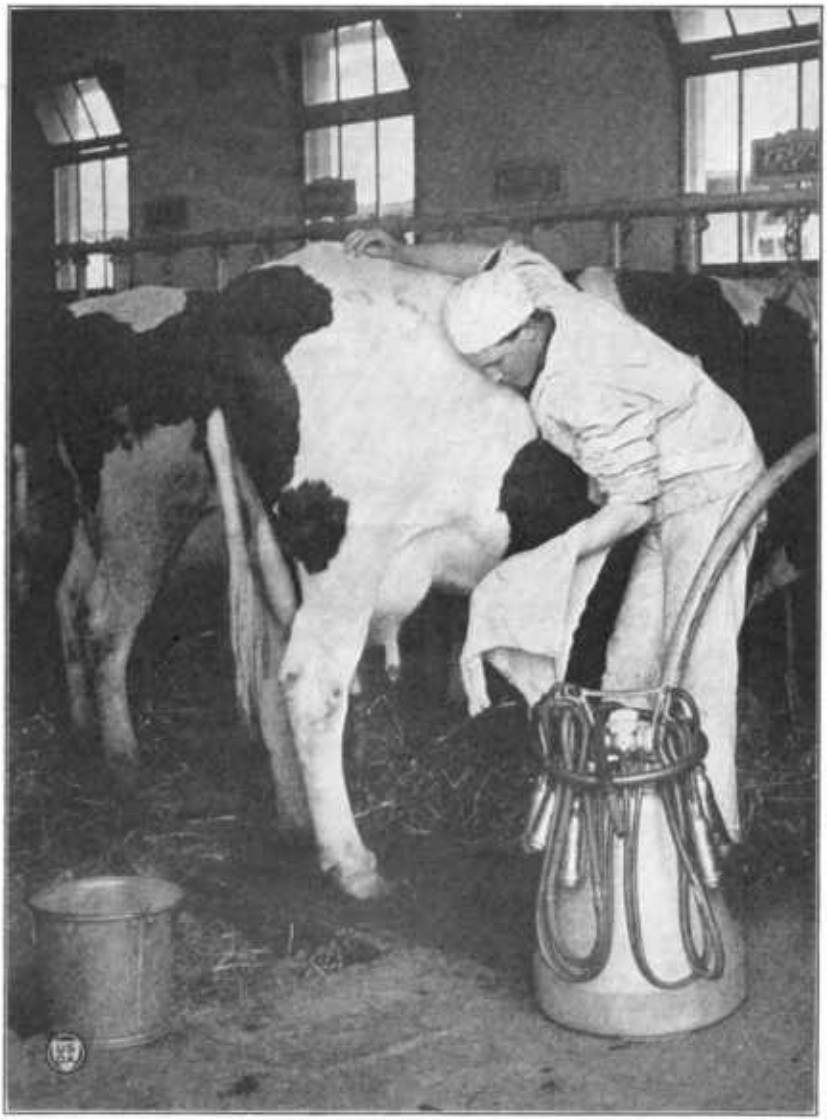

FIGURE 12.—The cleaned machine is assembled ready for use. Before milking is begun the udder and flanks of the cow should be wiped with a clean, damp cloth.

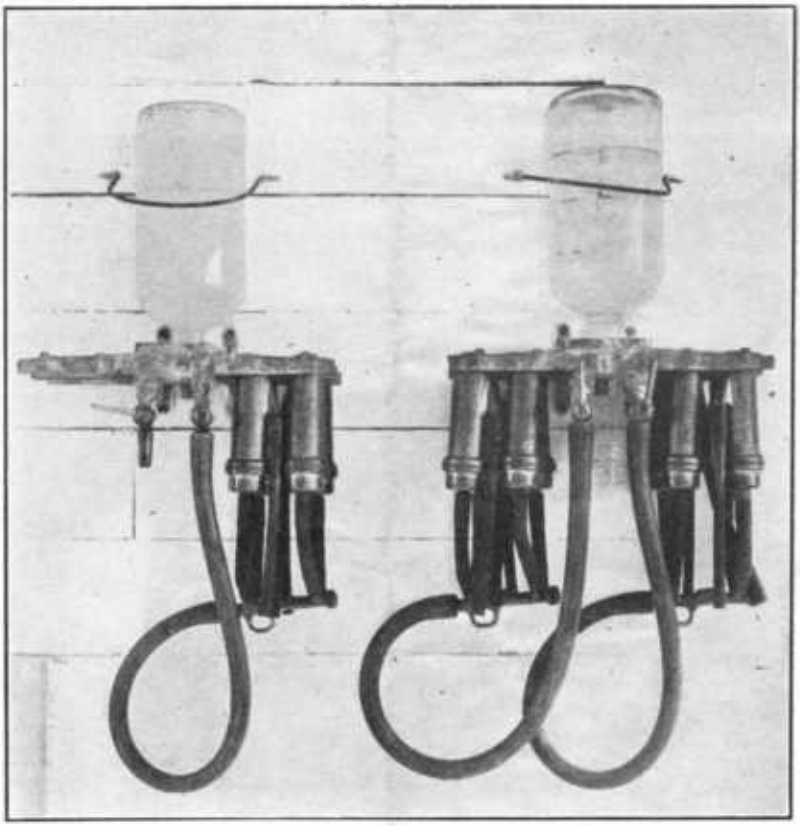

FIGURE 13.—Rack to hold teat cups between milkings. The bottle is filled with chlorine solution and then inverted in the rack and acts as a reservoir to keep the cups and tubes constantly full of the solution.

Samples of milk drawn with a unit placed in the refrigerator after being treated with heat showed an average bacterial count of 3,110 per milliliter, 99.3 percent of the samples having a bacterial count of 10,000 or less per milliliter.

A unit placed in the weak chlorine solution after treating with heat gave counts averaging 2,200 per milliliter with 100 percent of the samples having a bacterial count of 10,000 or less.

A unit hung in a warm room after being treated with heat gave counts averaging 5,540 per milliliter, 89 percent of the samples having a count of 10,000 or less per milliliter.

The length of life of the teat-cup liners was increased to nearly 23 weeks when the unit was removed from the hot water at the end of 20 to 40 minutes and placed in the refrigerator between milkings. The rubber tubing was still in good condition after 38 weeks of use.

All of these methods are simple and will give good results bacteriologically.

U. S. GOVERNMENT PRINTING OFFICE: 1939

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